



Department for
**Innovation,
Universities &
Skills**

Guide to the Bachelors degree in Professional Engineering

**Work-based pathway to
Incorporated Engineer registration**

*Flexible Pathways to becoming a Professional Engineer
A DIUS Gateways Development Funded Project*

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EXECUTIVE SUMMARY

The Engineering Council UK (EC^{UK}) regulates the engineering profession in the UK. It works through 36 professional engineering institutions (PEIs) which it has licensed to assess those of their members who wish to become registered with EC^{UK} as Chartered Engineers, Incorporated Engineers or Engineering Technicians.

EC^{UK} has developed standards for registration which reflect employer needs. It works closely with employer organisations and the education sector to ensure that the competences needed to practise engineering are understood and that qualifications to underpin these are identified, and where possible, accredited.

The Bachelors programme in Professional Engineering has been devised as part of the EC^{UK} DIUS-funded Gateways Project, *Flexible Pathways to becoming a Professional Engineer*, to provide a pathway to registration as an Incorporated Engineer through work-based learning. A work-based pathway to Chartered Engineer has also been developed.

Work-based learning provides a means of concurrently acquiring and utilising underpinning knowledge, understanding and skill-sets in work in order to meet Bachelors degree requirements and demonstrate competence. Competence acquisition can occur before, during or after a degree programme¹. This guide describes how suitably focused work-based learning can be monitored and regulated in order to meet the United Kingdom Standard for Professional Engineering Competence (UK-SPEC) competences for IEng registration.

In order to be considered for Incorporated Engineer registration, a candidate needs to possess an accredited Bachelors degree² or its equivalent. Holders of a Foundation Degree or a Higher National Certificate or Diploma in engineering or technology need to achieve the further learning necessary to be awarded a Bachelors degree. An NVQ4 or SVQ4 which has been approved for the purpose by a licensed engineering institution is also an exemplifying academic award.

This framework matches participants' learning to the QAA engineering benchmark³ and builds on Kingston University's existing work-based learning approach. It provides an affordable mechanism which, alongside recorded professional development in the work-place, enables participants to achieve the UK-SPEC competences for IEng without the need to take significant time away from work.

The objective of this initiative is to offer a regulated nationwide work-based mechanism that PEIs can assess to assure themselves that Bachelors level knowledge and understanding alongside professional development are suitable for their members to become potential registrants. EC^{UK} encourages universities and colleges offering Bachelors degrees in engineering to consider validating, and PEIs to consider accrediting, programmes within this regulated work-based framework.

The availability of such an affordable work-based route to IEng registration should mean that many more individuals, including those engineers⁴ working in smaller organisations, will be in a position to develop their knowledge and build on their existing competences, thereby improving their professional standing and increasing the nation's stock of IEng registered engineers. Employers will also benefit through the development of their workforce in areas directly relevant to their business.

¹ UK-SPEC states that developing competence may occur at the same time as formal education through industrial placements and other industry-based activities (UK-SPEC - Professional Development)

² Under UK-SPEC the exemplifying academic qualification for IEng registration is an accredited Bachelors or honours degree in engineering or technology

³ <http://www.qaa.ac.uk/academicinfrastructure/benchmark/statements/Engineering06.asp#p6>

⁴ Well over 90% of UK employees work for SMEs

1. INTRODUCTION

1.1 THE PROJECT AIMS

These are to:

- develop and pilot a model pathway to professional registration of engineers in which higher education and professional development are combined through a work-based approach;
- target groups who are under-represented in the engineering profession at present;
- help address the shortage of engineers and have a positive impact on retention.

They are being delivered by producing a set of work-based programmes, all conforming to a common framework that will be implemented by each participating educational institution and in due course considered for accreditation by PEIs. Each programme allows participants to gain sufficient knowledge, understanding and concurrent skill-sets within the work-place to demonstrate UK-SPEC competences through highly regulated and structured work-based learning and professional development. Eventual accreditation by PEIs will remove the need for each individual's programme to be assessed.

1.2 DOCUMENTATION STRUCTURE

This guide prescribes and describes the structure and organisation of the work-based pathway contained within the Bachelors in Professional Engineering framework. Each HEI or FE College delivering the programme will be required to ensure conformity to this framework described in Section 3 of this document. Each provider will develop its own operating manual that describes its own processes in more detail.

Other related documents are published on the engineering gateways website (www.engineeringgateways.co.uk). These include a guidance note on mentoring and assessment arrangements and protocols between EC^{UK} and the PEIs and education providers that set out the processes and responsibilities.

1.3 BACKGROUND

EC^{UK} was awarded funding from the DIUS *Gateways to the Professions* Development Fund in 2006 to develop a suite of programmes that established models of flexible pathways into and through higher education, leading to professional status in engineering. The project developed the existing successful work-based learning models run by Kingston University to provide routes to professional recognition. These pathways integrate education with supervised work-based professional development, thus potentially satisfying the requirements for professional registration. There is the potential for progression in stages from foundation degree to masters degree level. The expectation is that such work-based programmes will create new markets amongst engineers who wish to achieve registration, but are unwilling or unable to attend university or college-based higher education for various reasons, such as the prospect of time away from work and additional debt.

The need to design '*clear, accessible gateways for people who want to pursue professional careers*' is one of a number of recommendations in the *Gateways to the Professions Report* by Sir Alan Langlands, published in November 2005. Other recommendations, such as enabling flexible recruitment and training strategies, embracing students without exemplifying qualifications for their chosen career, and developing programmes that are increasingly relevant in both an international and a European context are expected to be addressed as the engineering programmes become established.

EC^{UK} is the principal partner in this project. Kingston University is the lead academic partner with three other Stage 1 HEI partners: the University of Hertfordshire, Northumbria University and Staffordshire University. Other universities and colleges are now involved as the model is rolled out. A key feature of the project is the opportunity to benefit from their existing links with industry. The aspiration is to involve a range of educational institutions to reflect diversity in type, size, engineering provision and geographic location.

The PEIs have an important role to play, in particular by ensuring that the programmes will enable participants to seek professional registration whilst also widening participation. The Institution of Engineering & Technology (IET), the Institution of Mechanical Engineers (IMechE) and the Royal Aeronautical Society (RAeS) have participated in the project since its inception, and others are now involved. A Steering Committee includes representatives from HEIs, PEIs, employers and Sector Skills Councils. Current participants are listed on the engineering gateways website: www.engineeringgateways.co.uk

1.4 BECOMING REGISTERED AS AN INCORPORATED ENGINEER

In order to be registered as an Incorporated Engineer (IEng), a candidate needs to demonstrate within a professional review undertaken by a PEI that the UK-SPEC threshold standards of competence and commitment have been met. Those who, based on the evidence provided in their applications, meet these UK-SPEC requirements are asked to attend a professional review and interview (PRI) with registered engineering professionals. Successful candidates are registered as IEng.

The development of competence and commitment requires the acquisition of skill-sets and experience for which underpinning knowledge and understanding has to be acquired. Education and professional development are the two key activities which facilitate this:

Education

Formal qualifications awarded after pursuing an educational programme provide the usual method of demonstrating underpinning knowledge and understanding for professional competence. Qualifications exemplifying the required knowledge and understanding for Incorporated Engineers are:

- an accredited Bachelors degree or honours degree in engineering or technology
- or a Higher National Certificate/Diploma or a Foundation Degree in engineering or technology, plus appropriate further learning to degree level
- or an NVQ4 or SVQ4 which has been approved for the purpose by a licensed engineering institution.

Candidates for registration who do not have such an exemplifying qualification must clearly demonstrate that they have achieved the same level of knowledge and understanding as those who do. They can do this by one of the following means:

- writing a technical report, based upon experience, and demonstrating knowledge and understanding of engineering principles;
- taking EC^{UK} examinations;
- following an assessed work-based learning programme;
- taking an academic programme specified by the institution to which they are applying.

Candidates without an exemplifying qualification are treated as *individual cases* by the PEIs when their applications for EC^{UK} registration are considered.

Professional Development

This is a key part of developing competence. It enables potential Incorporated Engineers to learn to apply their knowledge and understanding, and begin to apply professional judgement.

Although this system of gaining academic qualifications followed by professional development in the work-place works satisfactorily for many, a much greater number of eligible candidates could proceed to IEng status if an affordable and supportive route existed for engineers currently working in industry. This requires a regulated mechanism that allows working individuals who are undertaking bachelors degree learning as part of their work activities, to follow an approved work-based programme that, regardless of the company size:

- provides a means of obtaining a bachelors degree without the need for significant time away from work;
- provides an opportunity for participants to meet the UK-SPEC competences;
- allows all suitable employees to participate and become candidates for registration;
- proactively guides each potential candidate, step-by-step, towards an IEng professional review and interview.

2. WORK-BASED LEARNING & UK-SPEC

2.1 Work-based learning can provide a means of concurrently acquiring and utilising both underpinning knowledge, understanding and skill-sets in order to demonstrate competence. A report to HEFCE⁵ indicates that *learning in the workplace is learning through work that is embedded and accredited with a higher education programme*. Under UK-SPEC, education and professional development may occur concurrently.

2.2 Where a programme of work-based learning is validated by an educational institution as meeting its academic requirements for the award of a suitable Bachelors degree or the equivalent, then that programme may be considered by a PEI as providing sufficient underpinning knowledge and understanding for it to be accredited for IEng. Concurrent professional development within the workplace that provides appropriate skill-sets enables an individual to develop the necessary competences to be considered by a PEI for IEng registration at a professional review.

2.3 Participants will usually hold a Foundation Degree, Higher National Certificate or Diploma and through this programme, they may achieve the necessary further learning to be awarded a Bachelors degree.

Potential participants without such a qualification may be enrolled subject to an assessment of their existing academic qualification(s).

2.4 With regard to professional development, in using the UK-SPEC competence and commitment statements, participants may seek advice and guidance from their PEI, which may be able to put them in touch with a mentor to assist them through the process and help them identify where their competences require development.

⁵ Towards a Strategy for Workplace Learning - http://www.hefce.ac.uk/pubs/rereports/2006/rd09_06/rd09_06.doc

- 2.5 In some cases employers may use occupational standards or competence frameworks in determining job descriptions and staff development and these may assist in developing a competence profile; these methods alone, however, do not normally lead to an academic award.

3. THE BACHELORS PROGRAMME IN PROFESSIONAL ENGINEERING

3.1 PRINCIPLES OF THE FRAMEWORK:

- **Work-based learning.** The programme provides the participant with the opportunity to acquire during the period of study the underpinning knowledge and understanding and develop the UK-SPEC competences, without the need to attend a taught programme.
- **QAA and UK-SPEC conformance.** The programme conforms with QAA's level descriptor and engineering subject benchmark statement⁶ and the UK-SPEC IEng requirements for a Bachelors degree⁷.
- **Entry gateway.** Each participant undertakes a Professional Development Audit (PDA) entry gateway⁸. This PDA is a reflective examination and assessment of the participant's education, qualifications, experience and competences upon enrolment.
- **Exit gateway.** The programme finishes with an exit gateway. This is an overall evaluation of the participant's achievement of the learning outcomes with a review of the UK-SPEC competences achieved.
- **Validation.** Each programme will be validated by the university or college and be subject to its quality assurance processes.

3.2 ENTRY TO A PROGRAMME WITHIN THE FRAMEWORK

The programme is for those already in employment in the engineering profession. As part of the proposed Gateways work-based "escalator," illustrated in the *IEng Professional Engineering Framework Map* shown on page 9, participants may apply to enter the programme from any point in their career. They should be in a role that provides them with the opportunities to develop the necessary competences.

Each participant's competences are recorded and assessed at the Entry Gateway through a PDA. A competence mapping exercise is then used to determine the goals needed to address the difference between PDA and UK-SPEC competences. The participant is then able to work to achieve a series of learning and competence-building goals knowing that the completion of the programme is likely to meet the UK-SPEC competences⁹.

Early contact between the student and professional engineering Institution, overseen by the university or college, is essential and the process is outlined on the engineering gateways website: www.engineeringgateways.co.uk. The PEI provides feedback as to whether the documentation is an acceptable base for eventual professional review.

3.3 THE LEARNING CONTRACT

⁶ <http://www.qaa.ac.uk/academicinfrastructure/benchmark/statements/engineering06.asp#p12>

⁷ http://www.engc.org.uk/documents/Accreditation_HE_Programmes_RP.pdf

⁸ A PDA or similarly entitled entry gateway fulfilling the same purpose.

⁹ HEI/FE College Operating Manual

The Learning Contract is a work plan of how an individual can gain knowledge and competence whilst meeting company objectives. It is written in the form of a sequenced professional development plan linked to the company's activities. Section 5 of this guide provides further detail.

The Learning Contract is designed to raise the participant's levels of underpinning knowledge, understanding and skill-sets, mapped against UK-SPEC IEng competences, to enable them to become a candidate for IEng registration. It also ensures that participants, assessors and reviewers understand:

- what additional learning needs to take place and the credits which will be awarded;
- how it is to be achieved and assessed;
- how the activities meet the competence statements; and
- the estimated date of achievement when the participant can reasonably expect to be successful, subject to completion of the intended learning outcomes.

Alongside the Learning Contract, a record of professional development is maintained. Where PEIs have published frameworks for recording the development of professional competences, these can be completed alongside the programme documentation. The participant's PEI will provide guidance on how to record professional development. The PEI will also provide details of any specific additional requirements, how to achieve registration and any step-by-step help available.

Employer support will normally include a named company mentor. A guidance note on mentoring and assessment, published on the engineering gateways website, provides further details about roles and responsibilities.

3.4 MEMBERSHIP OF A PROFESSIONAL ENGINEERING INSTITUTION

The university or FE college will ensure that each programme participant completes a membership application form for the PEI of his or her choice at the appropriate grade. Some participants will be members already. The university or FE college will provide the participant with a letter and a copy of the Learning Contract to send to the PEI. The letter will confirm that the participant is embarking on an individually designed programme within the IEng Professional Engineering Framework supported by EC^{UK}.

3.5 CANDIDATES FOR REGISTRATION – THE EXIT GATEWAY

The Exit Gateway provides the final assessment of learning outcomes. This includes the examination of a work-based learning portfolio and, possibly, written examinations and a *viva voce* examination. Based on the record of professional development it also assesses the competence developed against the UK-SPEC competences. Successful completion of the programme results in an academic award and, assuming the competence requirements are met, eligibility to apply for registration through the normal PEI process of professional review and interview.

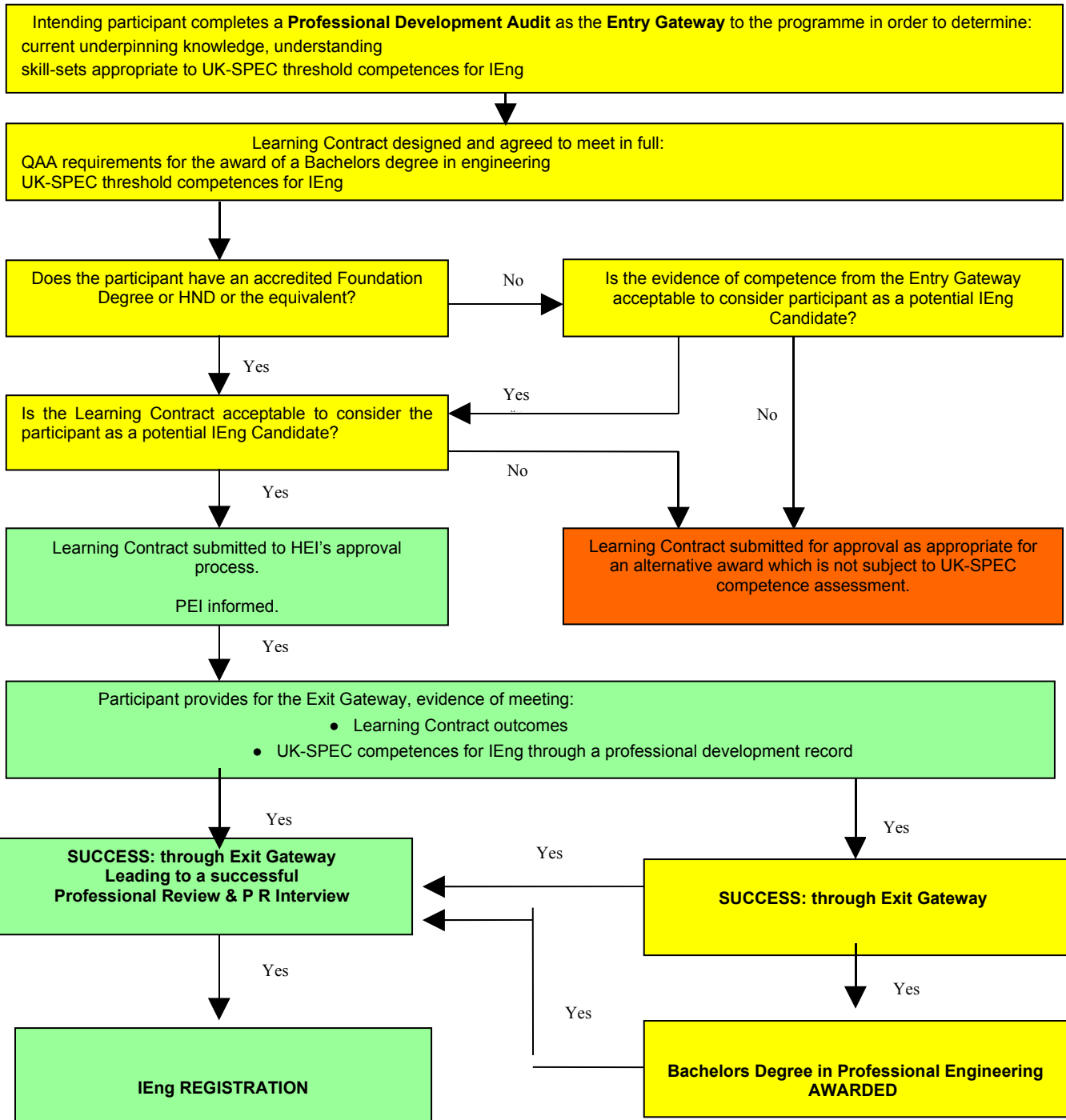
The completed work-based Learning Contract and the professional development record provide evidence for the professional review.

It is important to emphasise that, as for all candidates for professional review, there is no guarantee of professional registration, even for those awarded a Bachelors degree in Professional Engineering. What the programme does offer is a process of committed, step-

by-step help throughout, a work-friendly means of achieving additional learning and a way of having competences assessed *en route* to the participants' professional review and interview.

The pathway is dependent on the HEI process running alongside the PEI process, as shown in the *IEng Professional Engineering Framework process map* (page 9).

3.6 THE IEng PROFESSIONAL ENGINEERING FRAMEWORK – MAP



Key

- Participant within IEng Professional Engineering Framework
- Participant who becomes a potential candidate for IEng registration
- Student enrolled on alternative academic programme

4. THE PROFESSIONAL ENGINEERING INSTITUTIONS

4.1 ACCREDITATION

In conventional taught programmes, the intended academic content in the form of general learning outcomes is assessed against UK-SPEC and may subsequently be accredited by a PEI. The HEI or FE College then delivers set learning experiences based on the learning outcomes. The Bachelors in Professional Engineering is similar. The HEI or FE College uses a Learning Contract and mapping mechanism to ensure that the individually designed Learning Contract successfully maps to the accredited learning outcomes and UK-SPEC.

The learning outcomes shown in the university or college operating manual are internally validated and may be accredited by a PEI. Thus the role of the educational institution and the PEI is the same for both taught and work-based methods in that they are required to ensure that the intended learning outcomes meet the QAA and UK-SPEC requirements, and they have confidence that the outcomes will be delivered.

In the case of the Professional Engineering Framework pathway, there is a staged process:

- PEIs review the participant's documentation at an early stage and confirm whether they are an acceptable base for eventual professional review.
- At an appropriate point the PEIs review the provider's operating manuals and any further documents for compliance with the principles of this Guide and UK-SPEC and accredit the bachelors programme accordingly.

4.2 ASSESSMENT OF COMPETENCE FOR IENG REGISTRATION – THE PROTOCOL

The PDA and resulting Learning Contract ensure that the participant, the academic supervisor and the employer are clear at the outset about the activities and outcomes that meet both the UK-SPEC competences and the underpinning knowledge for IEng for successful completion of the programme.

A Protocol between EC^{UK} and the PEIs¹⁰ sets out the process for recognising participants following programmes adhering to this EC^{UK} model.

Once a sufficient number of participants have successfully completed a Bachelors in Professional Engineering programme, the PEIs may be in a position to confer accreditation. This would then enable each participant to be dealt with as a candidate for IEng registration via the standard route, with the Learning Contract not requiring individual verification by the PEI.

5. THE LEARNING CONTRACT APPROACH TO WORK-BASED LEARNING

The purpose of a Learning Contract is to set out what learning goals are to be achieved and/or modules are to be successfully completed as a result of work-based activities, and how competence development is to be evidenced. It is developed together by the employee, an academic supervisor and professional mentor/advisor. Involvement of the employer is key as they need to confirm that they will be able to provide the participant with appropriate and sufficient experience.

The approach enables working engineers to obtain an appropriate qualification without the need to complete a taught course. The Learning Contract provides a framework that enables the learning experience to be tailored specifically around work and the requirements of a PEI. Within the Learning Contract, a designated academic supervisor

¹⁰ See www.engineeringgateways.co.uk

helps an existing company employee to complete a company-critical work programme that is set out in the form of learning objectives and milestones. This may consist entirely of individual learning goals, based on current and future work activities, or it may include some taught modules. It may also be possible to gain credit from courses attended in the past, as well as previous work-based activities, provided they meet QAA Bachelors degree level descriptors. Nationally recognised credits at the appropriate QAA level and benchmark¹¹ are awarded for the learning outcomes resulting from these activities.

5.1 KEY FEATURES & BENEFITS

Key features/benefits of the work-based Learning Contract are:

- flexible, individually designed programmes, unique to each participant's needs and situation;
- recognition and accreditation of appropriate previous learning;
- option to attend taught modules, if appropriate;
- access to university or college learning resources;
- supervisor support throughout the programme.

For the individual, the Learning Contract offers a mechanism whereby an individual may complete a Bachelors degree programme and potentially meet PEI requirements.

An additional potential benefit is knowledge exchange. Companies need to innovate, but often cannot afford the necessary specialist skills or resources. This programme offers the potential for knowledge exchange between educational institutions and industry, and a company can develop staff in key areas without them spending periods away from work.

The learning outcomes, the activities that enable them to be achieved, the method of demonstrating that additional learning has taken place and the method of assessment are defined at the outset in the Learning Contract. Thus the participant is given a clear indication of what has to be achieved. Assessment is on-going and formative, thereby giving the participant vital feedback on progress.

5.2 HOW DOES THE LEARNING CONTRACT WORK?

- A university or college academic supervisor normally works with the employer and participant to review competences and achievements to date and identify and define suitably challenging opportunities, through which the individual will gain sufficient learning to achieve a Bachelors degree.
- Together they agree the Learning Contract and ensure that it meets the individual's needs, the QAA level requirements and any necessary regulatory requirements.
- Under agreed supervision, the participant completes the work-based tasks.
- The goal evidence or module is assessed, all evidence of learning is assembled, a reflective summary is written and presented and, based on this evidence, decisions are made as to the academic quality of the work.

¹¹ QAA Subject Benchmark Statements: www.qaa.ac.uk/academicinfrastructure/benchmark/default.asp.

- The participant undergoes examinations that review achievement and, upon satisfactory completion (and subject to Examination Board approval), obtains an appropriate award.

Details of each university's or college's Learning Contract are included in its operating manual.

5.3 CLARITY OF REQUIREMENT

Within a work-based Learning Contract, the learning outcomes record is crucial. It defines the outcomes to be met, the activities required to meet them and what assessment criteria and mode of assessment will be used.

To ensure confidence, the Learning Contract is reviewed by a subject expert. An independent briefer may also be involved and there may be a rigorous approval process operated by the university or college Board of Study. The participant then knows at the outset what is required during the programme.

5.4 LEARNING ACTIVITIES

As well as the learning that is generated in the workplace, each individual's programme may include a range of activities that result in additional learning. These could include validated bachelors degree level modules, company courses, validated professional courses, APL, APEL, company projects, learned papers and a reflective summary.

5.5 ASSESSMENT

The aim, where possible, is to use evidence of learning generated in the workplace to confirm that sufficient bachelors degree learning has taken place and been applied. The results of university or college examinations show the acquisition of knowledge but authenticated work outcomes show application. Potentially this may lead to fulfilment of PEI requirements in regard to both underpinning knowledge and understanding and competences.

Achievement is assessed by the supervisor (and usually the second assessor) at the time of submission. An external examiner is in place for each award. Each Bachelors in Professional Engineering programme concludes with an Exit Gateway assessment (see Section 3.5). Participants are required to demonstrate understanding through the application of engineering principles. This can be demonstrated through plans, reports, papers and analyses, demonstrating the application of such principles to engineering projects and systems appropriate to an Incorporated Engineer.

It is intended that participants will be eligible to apply for a professional review once they have completed their work-based programme according to their individual Learning Contract.

6. QUALITY ASSURANCE

As with accredited taught programmes, the Bachelors in Professional Engineering programmes will be subject to the normal internal validation and quality assurance processes in line with QAA requirements.

7. CONCLUSIONS

Indicators show that a greater number of eligible candidates could proceed to IEng status if an affordable, work-based and supportive route existed for all practising engineers. The Professional Engineering pathway meets a need for a regulated mechanism that allows working individuals to follow a work-based programme and demonstrate the necessary competences and underpinning knowledge, regardless of the size of the employer.

None of the elements of this pathway is new. What is new is the way they have been combined to provide an additional pathway for those who wish to become professional engineers.

The model offers an imaginative and potentially very successful way forward to increase the number of registered engineers. The processes outlined in this guide and the supporting documents will be developed and reviewed in the light of feedback from stakeholders. Users of the guide are encouraged to contact EC^{UK} with comments or suggested changes for increasing the effectiveness of the framework.